

## Correlation between pre operative ultrasound with intra operative factors associated with difficult laparoscopic cholecystectomy

Dr. Rajkumar Pachlaniya<sup>1</sup>, Dr. Sulabh Devaliya<sup>2</sup>, Dr. Pushpendra Singh Kanwar<sup>3</sup>, Dr. Vrajesh Fulbaria<sup>4</sup>

*1Senior Resident, Department Of Radiodiagnosis, Nscb Medical College Jabalpur*

*2Senior Resident, Department Of Radiodiagnosis, Nscb Medical College Jabalpur*

*3Senior Resident, Department Of Radiodiagnosis, Nscb Medical College Jabalpur*

*4Junior Resident, Department Of General Surgery, Chirayu Medical College and Hospital Bhopal*

[fulbaria.vrajesh7@gmail.com](mailto:fulbaria.vrajesh7@gmail.com)

[CORRESPONDING AUTHOR]

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### ABSTRACT

**Introduction-** Laparoscopic cholecystectomy is now accepted as the new gold standard for the treatment of symptomatic gallbladder disease. The main aim of this study is to look some preoperative predictor factors in ultrasound which can provide some idea about potential difficulties and complications that can be encountered by surgeons during laparoscopic cholecystectomy which can cause require conversion to open cholecystectomy. It is safe and effective in most of the cases but, is not free of complications and has some inherent disadvantages. Ultrasonography (USG) is the first investigation for diagnosing cholelithiasis with sensitivity and specificity of >90%. This study uses certain ultrasonographic parameters like gall bladder (GB) wall thickness, gall bladder size, gall bladder stone mobility and common bile duct (CBD) diameter, in the patients presenting with chronic calculus cholecystitis to predict difficulty during laparoscopic cholecystectomy and conversion to open cholecystectomy. **Methods:** this is an analytical cross-sectional prospective cohort study which includes 68 patients having symptomatic cholelithiasis in a one year. All patients underwent elective LC in Department of General Surgery in tertiary care center at Nagpur. Data were included preoperative ultrasonographic finding with intraoperative factors associated with difficult laparoscopic cholecystectomy. Continuous variables were presented as mean  $\pm$  SD and categorical variables were presented as absolute numbers and percentage. Nominal categorical data between the groups were compared using Chi-squared test or Fisher's exact test as appropriate. Regression analysis was also done to predict the USG findings to assess the outcomes. Statistical analysis was conducted with the SPSS (statistical package for the social science system) version 20.0, For all statistical tests, a p value less than 0.005 is significant. **Results:** In this study, a strong statistical correlation was found between preoperative ultrasound prediction factors and difficult laparoscopic cholecystectomy. **Conclusion:** The difficult laparoscopic cholecystectomy and conversion to open surgery can be predicted preoperatively based on ultrasound findings. Preoperative knowledge of those factors which predict difficulties in surgery are of great importance: Preoperative ultrasonography especially thickened GB wall and impacted GB stone in the neck amongst others are a good predictor of difficulty in laparoscopic cholecystectomy in majority of the cases and may be used as screening procedure to predict difficulty during laparoscopic cholecystectomy.

**Keywords-** laparoscopic cholecystectomy, common bile duct, cholelithiasis

### INTRODUCTION

Cholelithiasis is the most common biliary pathology worldwide but out of these Only 1–2% asymptomatic patients will develop symptoms requiring surgical intervention; yet cholecystectomy is one of the most common operations performed by General Surgeons.[3] The NIH (National Institute of Health) Consensus Conference held in 1992, stated that “Laparoscopic cholecystectomy is safe and effective in most of the cases but can be technically demanding, is not free of complications and has some inherent disadvantages. Certain factors play a role directly or indirectly in making the procedure of Laparoscopic Cholecystectomy difficult which can lead to conversion to Open Cholecystectomy (OC). Preoperative knowledge of those factors which predict difficulties in surgery are of great importance for the safety of patients and helpful to surgeons in early phase of learning curve for laparoscopic cholecystectomy. It also helps in a more meaningful and accurate preoperative counselling, improved operating room scheduling and efficiency and risk stratification which improves patient safety by minimizing time to conversion and better mental preparation of surgeons and acceptance by patients. There are studies with the aim to correlate preoperative findings in the form of clinical, biochemical, clinic-radiological and ultra-sonographic parameters individually or in combination with the difficulties and/or conversion during laparoscopic cholecystectomy. Most of the studies in literature are based on combined parameters making them bulky and difficult to use in day-to-day practice. Preoperative ultrasonography is a useful screening investigation in candidates undergoing laparoscopic cholecystectomy. Apart from the usual diagnostic information, operative difficulties can be well predicted by it in more than 50% of cases.[1] In these patients, surgeons can take up appropriate measures for adequate assistance in the operating room. On preoperative ultrasound findings,

surgeons can be aware of the potential problems during laparoscopic cholecystectomy and maintain a reasonable threshold of conversion if technical problems arise. [2]

**MATERIALS AND METHODS**

The present study was done on 68 patients with gallbladder disease requiring elective laparoscopic cholecystectomy in the Department of General Surgery, Lata Mangeshkar Hospital, Hingna, Nagpur, Maharashtra, India, two-year study from November 2019 to October 2021. The criteria for selection were as follows.

**INCLUSION CRITERIA-** The patients aged between 18 and 80 years presenting with Cholelithiasis with or without cholecystitis and who has undergone Laparoscopic Cholecystectomy.

**EXCLUSION CRITERIA**

1. Patients below 18 years of age.
2. Patients who presents with Obstructive Jaundice with CBD Calculus or other cause.
3. Patients not willing for surgery.

-Due approval was taken from Institutional Ethical Committee before undertaking the study. The selected patients were then informed about the procedure and written informed consent was taken. Patients were also informed about the possible conversion to open chole- cystectomy preoperatively.

-The following investigations were done: Hemogram, blood sugar, renal function tests, liver function tests (serum bilirubin, serum alkaline phosphatase, serum glutamic oxaloacetic transaminase, serum glutamic pyruvic transaminase, and prothrombin time) and chest X-ray.

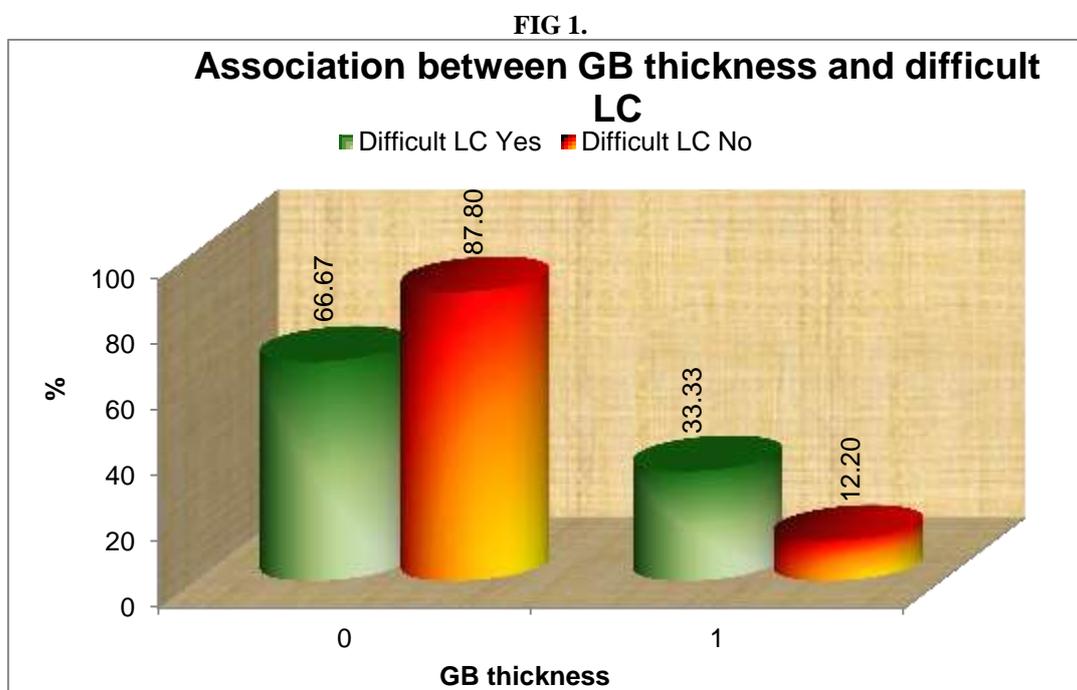
The following ultrasonographic parameters were used:

- Wall thickness of gallbladder <4 or >4 mm.
- Pericholecystic collection
- Impacted stone at the neck of the gallbladder.

**RESULTS**

**-Comparison of Gallbladder Wall Thickness with Difficulty in Laparoscopic Cholecystectomy**

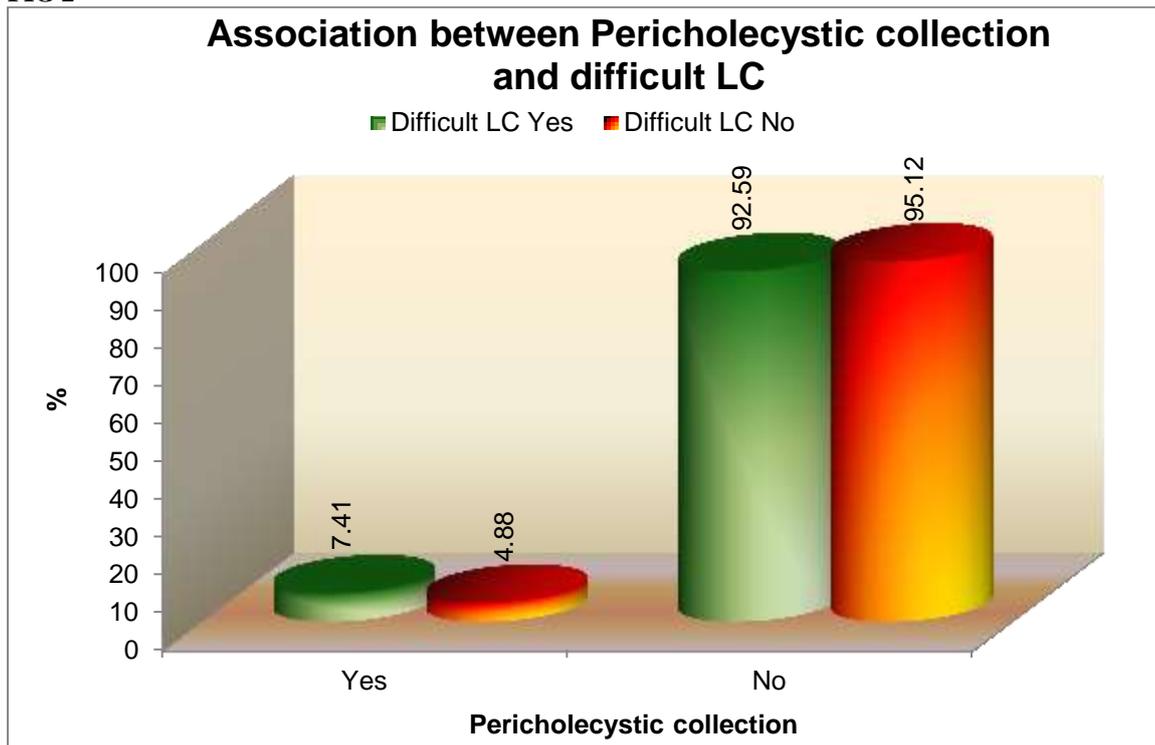
Of the 14 subjects with finding of thickened gall bladder wall >4mm, 9 had difficult laparoscopic cholecystectomy. Out of 54 cases with wall thickness of gallbladder <4 mm, 18 cases were found difficult/very difficult intraoperatively. (FIG 1)



**-Comparison of Pericholecystic Collection with Difficulty in Laparoscopic Cholecystectomy**

Of the 4 subjects with pericholecystic collection 2 were found to be difficult intra operatively. Out of 64 patients with no pericholecystic collection, 25 cases were difficult/very difficult intraoperatively. (FIG 2)

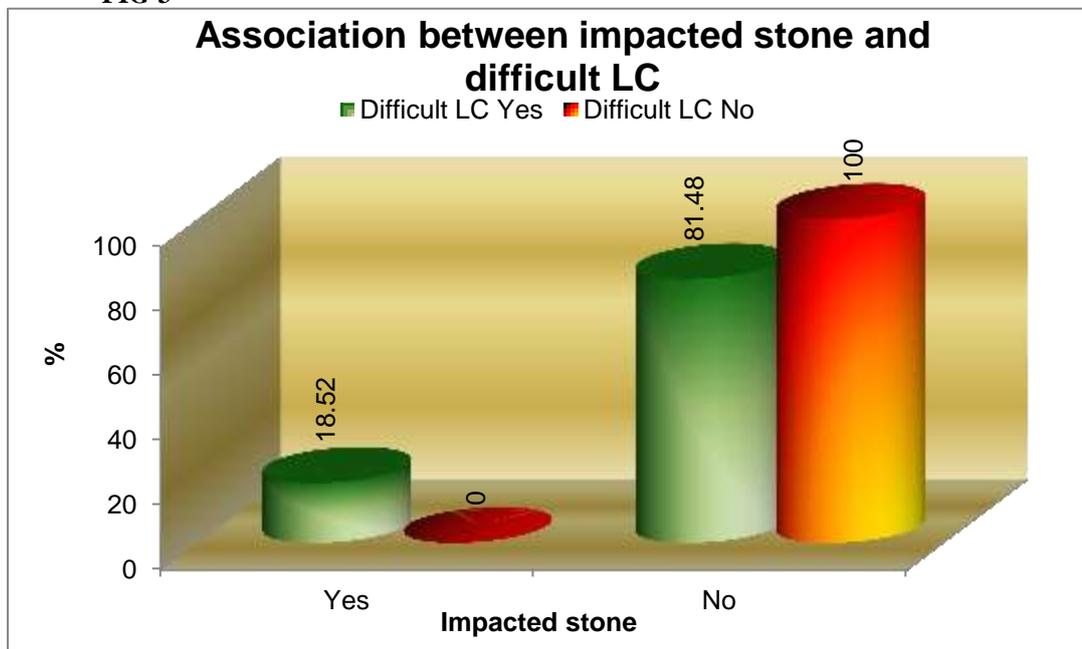
FIG 2



**-Comparison of Impacted Stone at Neck of Gallbladder with Difficult Cholecystectomy**

Out of 5 cases with impacted stone preoperatively, 5 cases were found difficult/very difficult intraoperatively. Out of 63 cases with no impacted stone at neck of gallbladder, 22 cases were found difficult/very difficult intraoperatively. (FIG 3)

FIG-3



**DISCUSSION**

Laparoscopic cholecystectomy is an operative procedure that has spread widely and rapidly through the surgical community.<sup>3</sup> this time this procedure on demanding by patients in a large scale. Several recent studies have demonstrated the safety of this procedure and it is now believed by many to be the treatment of choice for symptomatic cholelithiasis.<sup>4</sup> Laparoscopic cholecystectomy offers advantages of decreased postoperative pain, decreased hospital

stay, and an earlier return to normal activity.<sup>5</sup> also improved pulmonary functions in immediate postoperative period with laparoscopic cholecystectomy compared with conventional cholecystectomy have been well demonstrated.

In our study, a strong statistical correlation was found between preoperative ultrasound prediction factors and difficult laparoscopic cholecystectomy.<sup>6</sup> Gallbladder wall thickness is one of the ultrasonic parameters most extensively studied for the gall stone disease. Gallbladder wall thickness can be most accurately measured with a high degree of accuracy with ultrasonography. Usually, 95% of the patients have sonographic wall measurements that correlate to within 1 mm with the measurements taken at the time of surgery. It is generally agreed that a sonographic/pathologic wall thickness of 4 mm constitutes the upper limit of normal and may serve as a demarcation between thin-walled and thick-walled gallbladder. In our study, we have arbitrarily divided wall thickness measured on ultrasound examination into two groups: <4 mm and >4 mm.

Gallbladder wall thickness >4 mm was predicted to be difficult gallbladders of all the 50 cases studied. Fourteen (20.59%) patients were found to have gallbladder wall thickness >4 mm on ultrasound in our study, and nine of these cases were actually difficult on surgery. The sensitivity of the gallbladder wall thickness on ultrasound is 90.47% for predicting the difficult laparoscopic cholecystectomy, though the positive predictive value for difficult surgery is 39.58%.<sup>7</sup>

Presence of pericholecystic collection signifies acute cholecystitis and also makes visualization of the gall bladder difficult. Presence of pericholecystic collection was not identified as a risk factor for difficult laparoscopic cholecystectomy in this study. However, in literature pericholecystic collection was identified as a significant risk factor for difficult laparoscopic cholecystectomy.

Stone impacted at the neck is another important parameter that shows a good predictive value.<sup>8</sup> Clinically, all of these 5 patients had palpable gallbladder. Of these 5 cases (18.52%), with the stone impacted at the neck, 5 cases were difficult on surgery. The reason for the difficulty in surgery was that the impacted stone caused formation of mucocele and posed great difficulty in holding the infundibulum of gallbladder for retraction during dissection, leading to difficult surgery when continued. The impaction of the stone on ultrasonography is seen by conducting the ultra-sonography in supine and reclining/erect position, the mobile stone will slide toward the fundus of the gallbladder. The fallacy of this test is in predicting the impaction at the neck of gallbladder which is full of gall stones, and the contracted gallbladder in which the stones do not move even if they are not impacted in the neck.

This study found that there was a significant correlation between preoperative USG prediction and difficulty in LC. Out of the cases predicted to be difficult on USG, 69.23% cases were actually found to be difficult giving a positive predictive value (PPV) of around 70% for difficult cases on LC.

Prediction of Difficult Laparoscopic Cholecystectomy Based on Preoperative Ultra-Sonographic Findings have also found contracted GB to be significant predictor of difficult LC. D Urbano *et al* in a series of 200 cases found that USG findings relate to the difficulty of LC more closely than any other preoperative investigation. [7] But in contrast, study by Carmody *et al* [5] did not find any correlation between the preoperative USG findings and difficult LC but this discrepancy could not be explained. There was also a significant correlation between preoperative USG prediction and conversion to OC (p value = 0.030). The sensitivity, specificity, PPV and NPV of USG for conversion to open procedure are 62.5%, 76.4%, 19.2% and 95.8% respectively. The PPV of USG in predicting conversion to OC was low in this study as difficult dissection secondary to dense adhesions at the Calot's triangle and between GB and surrounding structure was the most common cause of conversion to OC in our study. These adhesions could not be accurately assessed on preoperative USG. This observation was also corroborated by retrospective study on 1000 patients by Kama *et al*, who found a conversion rate of 4.8%.

## CONCLUSION

From this prospective analytic observational study, we found that preoperative ultrasonographic finding can predict for difficult laparoscopic cholecystectomy, which can help for both surgeons and patients relatives preoperatively. The impaction of stone at the neck of the gallbladder and the increased gallbladder wall thickness are good predictors of the potential operative difficulty and conversion to open procedure whereas pericholecystic collection in our study does not show any correlation with difficult laparoscopic cholecystectomy. It may help the surgeon to get an idea of the potential difficulty that he can face in a particular patient, from this study we find out preoperative factors which help in great extent for surgeons in laparoscopic cholecystectomy.

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